

Listing of Claims

This listing of claims will replace all prior versions and listings of claims in the Application for patent.

1-24 (Canceled)

25. (Currently Amended) A fiber cement composite building material incorporating a cementitious matrix and delignified and individualized cellulose fibers,

wherein at least a portion of the cellulose fibers are pretreated prior to incorporating through ~~with~~ an elevated temperature washing process to reduce COD content of the cellulose fibers to less than 4.5 kg/ton,

wherein the elevated temperature is between about 65 degrees Centigrade to about 120 degrees Centigrade,

wherein the COD content of the cellulose fibers alone is measurable from a filtrate after a portion of the cellulose fibers alone are dispersed in a solution and measured prior to being combined to form the composite building material,

wherein the reduced COD cellulose fibers comprise about 2% to 20% by weight, and wherein the reduced COD cellulose fibers add strength reinforcement to the fiber cement composite building material and

wherein the fiber cement composite building material is autoclaved.

26. (Canceled)

27. (Canceled)

28. (Previously Presented) The composite building material of Claim 25, wherein the cellulose fibers are cellulose fibers made from cellulose pulps of lignocellulosic materials by a pulping process.

29. (Original) The composite building material of Claim 25, further comprising an aggregate.

30. (Original) The composite building material of Claim 29, wherein the aggregate is ground silica.

31. (Original) The composite building material of Claim 25, further comprising one or more density modifiers.

32. (Original) The composite building material of Claim 25, further comprising one or more additives.

33. (Currently Amended) A material formulation used to form a fiber cement composite building material, comprising:

a cementitious binder;

an aggregate;

one or more density modifiers;

one or more additives; and

delignified and individualized cellulose fibers, wherein at least a portion of the fibers are pretreated prior to incorporating into the formulation through ~~with~~ an elevated temperature washing process to reduce COD content of the cellulose fibers to less than 4.5 kg/ton of oven dried pulp, wherein the elevated temperature is between about 65 degrees Centigrade to about 120 degrees Centigrade, wherein the COD content of the cellulose fibers is measurable from a filtrate prior to being combined to form the fiber cement composite building material, and wherein the reduced COD cellulose fibers comprise about 2% to 20% of the formulation by weight ~~and wherein the fiber cement composite building material is autoclaved.~~

34. (Original) The formulation of Claim 33, wherein the cementitious binder is selected from the group consisting of Portland cement, high alumina cement, lime, high phosphate cement, and ground granulated blast furnace slag cement, and mixtures thereof.

35. (Original) The formulation of Claim 33, wherein the aggregate is selected from the group consisting of ground silica, amorphous silica, micro silica, diatomaceous earth, coal combustion fly and bottom ashes, rice hull ash, blast furnace slag, granulated slag, steel slag, mineral oxides, mineral hydroxides, clays, magnasite or dolomite, metal oxides and hydroxides, and polymeric beads, and mixtures thereof.

36. (Original) The formulation of Claim 33, wherein the density modifier is selected from the group consisting of plastic materials, expanded polystyrene, glass and ceramic materials, calcium silicate hydrates, microspheres and volcano ashes including perlite, pumice, shirasu basalt, and zeolites in expanded forms, and mixtures thereof.

37. (Original) The formulation of Claim 33, further comprising additional fibers selected from the group consisting of natural inorganic fibers, synthetic polymer fibers, regular cellulose fibers and mixtures thereof.

38. (Currently Amended) The formulation of Claim 33, wherein the reduced COD fibers are fibrillated to a ~~the~~ freeness of about 150 to 750 degrees of Canadian Standard Freeness.

39. (Canceled)

40. (Original) The formulation of Claim 33, comprising about 10%-80% cement by weight.

41. (Original) The formulation of Claim 33, comprising about 20%-80% silica by weight.

42. (Original) The formulation of Claim 33, comprising about 0%-50% lightweight density modifiers by weight.

43. (Original) The formulation of Claim 33, comprising about 0%-10% additives by weight.

44. (Previously Presented) The formulation of Claim 33, wherein the reduced COD fibers improve the modulus of rupture of the fiber cement composite building material by more than about 10%, compared to a fiber cement composite building material made with an equivalent formulation containing fibers with COD content greater than 5 kg/ton of oven dried pulp measurable from a filtrate.

45. (Previously Presented) The formulation of Claim 33, wherein the reduced COD fibers improve the modulus of elasticity of the fiber cement composite building material by more than about 10%, compared to a fiber cement composite building material made with an equivalent formulation containing fibers with COD content greater than 5 kg/ton of oven dried pulp measurable from a filtrate.

46. (Previously Presented) The formulation of Claim 33, wherein the reduced COD fibers improve the ultimate strain of the fiber cement composite building material by more than about 10%, compared to a fiber cement composite building material made with an equivalent formulation containing fibers with COD content greater than 5 kg/ton of oven dried pulp measurable from a filtrate.

47. (Previously Presented) The formulation of Claim 33, wherein the reduced COD fibers reduce the amount of COD released to process water by more than about 10% in the manufacture of the fiber cement composite building material, compared to a fiber cement composite building material made with an equivalent formulation containing fibers with COD content greater than 5 kg/ton of oven dried pulp measurable from a filtrate.

48. (Previously Presented) The formulation of Claim 33, wherein the reduced COD fibers improve the toughness physical and mechanical properties of the fiber cement composite building material, compared to a fiber cement composite building material made with an equivalent formulation containing a fiber with COD content greater than 5 kg/ton of oven dried pulp measurable from a filtrate.

49-73. (Canceled)

74. (Currently Amended) A composite building material formulation that comprises a cementitious matrix incorporating reinforcing fibers, wherein at least a portion of the fibers are delignified cellulose fibers having a COD content of less than about 4.5 kg/ton of oven dried pulp, and

wherein the composite building material formulation is manufactured into a composite building material by a ~~the~~ method comprising:

preparing delignified cellulose fibers to have a COD content of less than about 4.5 kg/ton of oven dried pulp by pretreating through an elevated temperature washing process that includes chemicals which react with COD compounds causing the COD compounds to be more soluble and to reduce COD content of the cellulose fibers to less than 4.5 kg/ton using an elevated temperature between about 65 degrees Centigrade to about 120 degrees Centigrade;

mixing the prepared and delignified ~~low-COD~~ cellulose fibers with the cementitious matrix and other ingredients to form a fiber cement mixture;

forming the fiber cement mixture into a fiber cement article using a process selected from the group consisting of Hatschek, Mazza pipe, Magnani, injection molding, extrusion, hand lay-up, multi-wire forming, gap blad forming and bel-roll forming, the fiber cement article of a pre-selected shape and size; and

curing the fiber cement article so as to form the fiber reinforced composite building material.

75. (Previously Presented) The method of Claim 74, further comprising adding additional fibers into the formulation wherein the additional fibers are selected from the group consisting of natural inorganic fibers, synthetic polymer fibers, regular cellulose fibers and mixtures thereof.

76. (Currently Amended) A material formulation used to form a composite building material, the formulation comprising:

a cementitious binder in a range of about 10%-80% by weight, wherein the cementitious binder is selected from the group consisting of Portland cement, high alumina cement, lime, high phosphate cement, and ground granulated blast furnace slag cement, and mixtures thereof;

an aggregate in a range of about 20%-80% by weight, wherein the aggregate is selected from the group consisting of ground silica, amorphous silica, micro silica, diatomaceous earth, coal combustion fly and bottom ashes, rice hull ash, blast furnace slag, granulated slag, steel slag, mineral oxides, mineral hydroxides, clays, magnasite or dolomite, metal oxides and hydroxides, and polymeric beads, and mixtures thereof;

one or more density modifiers up to ~~in a range of 0%-50%~~ by weight, wherein the density modifier is selected from the group consisting of plastic materials, expanded polystyrene, glass and ceramic materials, calcium silicate hydrates, microspheres and volcano ashes including perlite, pumice, shirasu basalt, and zeolites in expanded forms, and mixtures thereof;

one or more additives in a range of up to ~~about 0%-10%~~ additives; and

delignified and individualized cellulose fibers, wherein at least a portion of the fibers are pretreated alone prior to incorporating into the formulation ~~with~~ in an elevated temperature washing process to reduce COD content to less than 4.5 kg/ton of oven dried pulp, wherein the elevated temperature is between about 65 degrees Centigrade to about 120 degrees Centigrade, wherein the COD content of the cellulose fibers is measurable from a filtrate prior to being combined to form the composite building material, wherein the reduced COD fibers are fibrillated to the freeness of about 150 to 750 degrees of

Canadian Standard Freeness, wherein the reduced COD cellulose fibers comprise about 2% to 20% of the formulation by weight; and

~~wherein the formed composite building material is autoclaved.~~

77. (New) A material formulation used to form a composite building material, comprising:

a cementitious binder up to about 35% by weight, wherein the cementitious binder is Portland cement;

an aggregate up to about 57% by weight, wherein the aggregate is silica;

delignified and individualized cellulose fibers up to about 8% by weight, wherein at least a portion of the delignified and individualized cellulose fibers are pretreated before incorporating into the formulation using an elevated temperature washing process to reduce COD content of the delignified cellulose fibers to less than 4.5 kg/ton of oven dried pulp and the elevated temperature is between about 65 degrees Centigrade to about 120 degrees Centigrade, and wherein the COD content is measured from cellulose fibers alone.

78. (New) The material formulation of claim 77, further comprising one or more additives.

79. (New) The material formulation of claim 77, wherein the COD content of the cellulose fibers is measurable from a filtrate prior to being combined in the formulation.

80. (New)) The material formulation of claim 77, wherein the reduced COD fibers are fibrillated to a freeness of about 150 to 750 degrees of Canadian Standard Freeness before being combined in the formulation.

81. (New) The material formulation of claim 77, wherein the cellulose fibers are from a softwood.

82. (New) A fiber cement composite building material comprising a cementitious matrix and delignified cellulose fibers,

wherein the cementitious matrix includes Portland cement up to about 35% by weight and a silica aggregate up to about 57% by weight of the building material,

wherein the delignified cellulose fibers are to about 8% by weight of the building material, wherein the cellulose fibers are pretreated before incorporating into the

cementitious matrix using an elevated temperature washing process to reduce COD content of the delignified cellulose fibers to less than 4.5 kg/ton of oven dried pulp and the elevated temperature is between about 65 degrees Centigrade to about 120 degrees Centigrade.

83. (New) The composite building material of Claim 82, wherein the cellulose fibers from a softwood.

84. (New) The composite building material of Claim 82, wherein the cementitious matrix includes one or more density modifiers.

85. (New) The composite building material of Claim 82, wherein the cementitious matrix includes one or more additives.

86. (New) The composite building material of Claim 82, wherein COD content of the cellulose fibers is less than about 3.5 kg/ton.